

# Cheng Zhang

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## Curriculum vitae

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### Education

- 2018 — Now **Doctor of Philosophy, Computer Science**, Boston University, Boston, MA  
**Research Interests:** Algebra, Logic, Program Semantics, Program Verification.
- 2014 — 2018 **Bachelor of Art, Mathematics**, *with department honor, magna cum laude*, Wheaton College, Norton, MA  
Minor in Computer Science and Economics. Major GPA: 3.87, Overall GPA: 3.83  
**Honor Thesis:** King in Generalized Tournaments.  
**Honors and Fellowships:** Dean's Lists, 2014 — 2018; Wheaton Fellows, 2016; Faculty-Student Research Awards, 2017
- 2016 — 2017 **Study Aboard, Economics**, London School Of Economics, London, United Kingdom

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### Publications

- 2021 **Cheng Zhang, Arthur Azevedo de Amorim, Marco Gaboardi**, *On Incorrectness Logic and Kleene Algebra With Top and Tests*, Submitted to POPL22 for review
- 2020 **Mark Lemay, Cheng Zhang, William Blair**, *Developing a Dependently Typed Language with Runtime Proof Search (Extended Abstract)*, Workshop on Type-Driven Development
- 2018 **Cheng Zhang**, *King in Generalized Tournaments*, Wheaton College Honor Thesis
- 2018 **Cheng Zhang, Weiqi Feng, Emma Steffens, Alvaro de Landaluce, Scott Kleinman, Mark D. LeBlanc**, *Lexos 2017: Building Reliable Software in Python*, Conference for Computing in Small Colleges, UNH-Manchester

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### Talks

- 2018 **Cheng Zhang, Mark D. LeBlanc**, *Lexos 2017: Building Reliable Software in Python*, Conference for Computing in Small Colleges, UNH-Manchester
- 2018 **Cheng Zhang**, *Kings in Quasi-transitive Oriented Graph*, Wheaton Summit For Woman In STEM

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## Research Projects

2021 — Now **Probabilistic Kleene Algebra**

2020 — Now **Algebraic Formulation Of Incorrectness Logic**

We investigate the support that KAT provides for reasoning about *incorrectness*, as embodied by Ohearn's recently proposed incorrectness logic. We show that KAT cannot directly express incorrectness logic. To address this issue, we study Kleene algebra with Top and Tests (TopKAT), an extension of KAT with a top element. We show that TopKAT is powerful enough to express a codomain operation, to express incorrectness triples, and to prove all the rules of incorrectness logic sound. This shows that one can reason about the incorrectness of while-like programs by means of the equational theory of TopKAT.

2017 — 2018 **Mathematics Honor Thesis**, *Wheaton College Mathematics Department*, Norton, MA

Studies kings in generalizations of tournament, with a special focus on quasi-transitive oriented graphs. I have shown that all the quasi-transitive oriented graphs can be condensed into a tournament via tie component condensation, and tie component condensation of quasi-transitive oriented graphs is the most efficient condensation to tournament.

2015 — 2018 **Software Leader**, *Lexomics Research Group*, *Wheaton College*, Norton, MA

Lead a major factorization of the text analysis software Lexos. In the process, the team adopted modern development workflows and transitioned the code base to a functional-first paradigm for ease of maintenance. I have also proposed a new architecture for side-effect management in Python.

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## Employment

2019 — Now **Research Assistant**, *Boston University*, Boston, MA

My research focuses on extensions of Kleene Algebra, which is a powerful algebra useful to model programming languages. The algebra can express least fix-point (recursion), while loop, if statement, and nondeterminism with little effort. It is ideal to model programming languages.

Kleene Algebra and its extensions are commonly used to build tools to perform automatic program verification and program analysis. They also serve as foundations to understand and develop new program logic.

2019 — 2021 **Teaching Fellow**, *Boston University*, Boston, MA

- 2020 Fall, CS 230: Principle of Programming Language, with Professor Marco Gaboardi and Lecture Abbas Attarwala
- 2020 Summer, CS 111: Introduction to Computer Science 1, with Lecture John Magee
- 2020 Summer, CS 112: Introduction to Computer Science 2, with Lecturer Christine Papadakis-Kanaris
- 2020 Spring, CS 235: Algebraic Algorithm, with Professor Leonid Levin
- 2019 Fall, CS 132: Geometric Algorithm, with Lecture Abbas Attarwala
- 2019 Spring, CS 230: Principle of Programming Language, with Professor Wayne Snyder

2019 **Grader**, *Boston University CS 511 Formal Method*, Boston, MA

2017 — 2018 **Grader**, *Wheaton College MATH 241 Theory of Probability*, Norton, MA

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## Honors

2018 — Now A member of Phi Beta Kappa.

2018 Madeleine F. Clark Wallace Mathematics Prize.

Fred Kollett Prize in Mathematics & Computer Science.

Phi Beta Kappa Graduate Scholarship.